

## **APPENDIX 3**

### **Report to Congressional Requesters, Arizona Border Region, Federal Agencies Could Better Utilize Law Enforcement Resources in Support of Wildland Fire Activities**

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**GAO**

**United States Government Accountability Office**  
**Report to Congressional Requesters**

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**November 2011**

**ARIZONA BORDER  
REGION**

**Federal Agencies  
Could Better Utilize  
Law Enforcement  
Resources in Support  
of Wildland Fire  
Management Activities**







Highlights of [GAO-12-73](#), a report to congressional requesters

November 2011

## ARIZONA BORDER REGION

### Federal Agencies Could Better Utilize Law Enforcement Resources in Support of Wildland Fire Management Activities

#### Why GAO Did This Study

Wildland fires can result from both natural and human causes. Human-caused wildland fires are of particular concern in Arizona—especially within 100 miles of the U.S.-Mexico border because this is a primary area of entry for illegal border crossers and GAO has previously reported that illegal border crossers have been suspected of igniting wildland fires. Over half of the land in the Arizona border region is managed by the federal government—primarily by the Department of Agriculture's Forest Service and four agencies within the Department of the Interior. These agencies collaborate with state, tribal, and local entities to respond to wildland fires. GAO was asked to examine, for the region, the (1) number, cause, size, and location of wildland fires from 2006 through 2010; (2) economic and environmental effects of human-caused wildland fires burning 10 or more acres; (3) extent to which illegal border crossers were the ignition source of wildland fires on federal lands; and (4) ways in which the presence of illegal border crossers has affected fire suppression activities. GAO reviewed interagency policies and procedures; analyzed wildland fire data; and interviewed federal, tribal, state, and local officials, as well as private citizens.

#### What GAO Recommends

GAO recommends, among other things, that the agencies develop strategies for selecting fires to investigate and establish a risk-based approach for utilizing law enforcement resources. In their comments on a draft of this report, the Forest Service and the Department of the Interior generally agreed with these recommendations.

View [GAO-12-73](#) or key components. For more information, contact Anu K. Mittal at (202) 512-3841 or [mittala@gao.gov](mailto:mittala@gao.gov).

#### What GAO Found

From 2006 through 2010, at least 2,467 wildland fires occurred in the Arizona border region. Of this number, 2,126, or about 86 percent, were caused by human activity. The majority of these fires—1,364—burned less than 1 acre each. About 63 percent or 1,553 of the 2,467 fires were ignited on federally managed land or tribal land.

Human-caused wildland fires that burned 10 or more acres had a number of economic and environmental impacts on the Arizona border region, but these impacts cannot be fully quantified because comprehensive data are not available. Specifically, these fires resulted in (1) over \$35 million in fire suppression costs by federal and state agencies, (2) destruction of property, (3) impacts on ranching operations, and (4) impacts on tourism. Similarly, these fires had several environmental impacts, such as the expansion of nonnative plant species, degraded endangered species habitat, and soil erosion. However, the full economic and environmental impacts cannot be determined because complete information about these impacts is not available.

The total number of fires ignited by illegal border crossers on federal lands in the Arizona border region is not fully known, in part because federal land management agencies have not conducted investigations of all human-caused wildland fires that occurred on these lands, as called for by agency policy, and the agencies do not have a strategy for selecting fires they do investigate. Of the 422 human-caused wildland fires that occurred on Forest Service, Interior, or tribal lands and burned at least 1 acre from 2006 through 2010, only 77 were investigated. According to land management agency officials, the lack of trained fire investigators was the primary reason for the limited number of investigations. Of the investigations conducted, 30 identified illegal border crossers as a suspected source of ignition. Agency policy notes that identifying trends in fire causes is critical to the success of fire prevention programs, but without better data on the specific ignition sources of human-caused wildland fires in the region, the agencies are hampered in their ability to target their efforts to prevent future wildland fires.

The presence of illegal border crossers has complicated fire suppression activities in the Arizona border region. According to agency officials, the presence of illegal border crossers has increased concerns about firefighter safety and, in some instances, has required firefighters to change or limit the tactics they use in suppressing fires. For example, the presence of illegal border crossers has limited firefighting activities at night and complicated the use of aerial firefighting methods. The agencies have taken some steps to mitigate the risks to firefighters by, for example, using law enforcement to provide security. However, none of the agencies have developed or implemented a risk-based approach for addressing these challenges. Consequently, law enforcement resources are routinely dispatched to all fires regardless of the risk, which may prevent the agencies from using their limited resources most efficiently. Moreover, while the Forest Service has developed a formal policy for addressing the risks to firefighters in the region, the other agencies have neither formally adopted this policy nor developed their own.



# Contents

Letter		1
	Background	4
	Number, Cause, Size, and Location of Wildland Fires in the Arizona Border Region	9
	The Economic and Environmental Effects of Significant Wildland Fires in the Arizona Border Region Are Not Fully Known	12
	Federal Agencies Did Not Conduct Investigations of All Human-Caused Wildland Fires and Thus Cannot Determine the Number Ignited by Illegal Border Crossers	20
	The Presence of Illegal Border Crossers Has Complicated Fire Suppression Activities, and Agencies' Responses May Not Fully Address the Issue	27
	Conclusions	32
	Recommendations for Executive Action	33
	Agency Comments and Our Evaluation	34
Appendix I	Scope and Methodology	37
Appendix II	Information on Significant Human-Caused Wildland Fires in the Arizona Border Region, 2006 through 2010	41
Appendix III	Additional Information on Wildland Fires That Federal Agencies Suspect Were Ignited by Illegal Border Crossers	48
Appendix IV	Comments from the U.S. Department of Agriculture	52
Appendix V	Comments from the Department of Homeland Security	53
Appendix VI	GAO Contact and Staff Acknowledgments	54

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## Tables

Table 1: Wildland Fires in the Arizona Border Region from 2006-2010, by Land Management Entity	12
Table 2: Number of Wildland Fires Investigated, by Agency, 2006-2010	21
Table 3: Acres Burned, Duration, and Suppression Costs for Significant Human-Caused Wildland Fires in the Arizona Border Region, 2006 through 2010	41
Table 4: Wildland Fires That Burned One or More Acres for Which Formal Fire Investigations Identified Illegal Border Crossers as a Suspected Cause	48
Table 5: Wildland Fires for Which Fire Incident Reports Indicate Illegal Border Crossers as a Suspected Cause	49

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## Figures

Figure 1: Land Management in the Arizona Border Region	5
Figure 2: Wildland Fires in the Arizona Border Region, by Cause, 2006-2010	10
Figure 3: Location of Significant Human-Caused Wildland Fires in the Arizona Border Region, 2006-2010	11
Figure 4: Wildland Fires on Federal Lands for Which Agency Investigation Reports Identified Illegal Border Crossers as a Suspected Ignition Source	24
Figure 5: Locations of Wildland Fires for Which Agency Fire Incident Reports Identified Illegal Border Crossers as a Suspected Ignition Source	51

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#### **Abbreviations**

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
DOD	Department of Defense
DHS	Department of Homeland Security
FWS	Fish and Wildlife Service
NIFC	National Interagency Fire Center
NPS	National Park Service
USDA	United States Department of Agriculture

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#### Congressional Requesters

A natural part of many ecosystems, wildland fires can have devastating effects on communities, damage sensitive ecosystems, and be costly to suppress. Wildland fires may be ignited by lightning or as a result of human activities, such as improperly extinguished campfires, sparks from equipment and vehicles, or recreational shooting. Fires triggered by natural causes are inevitable and play an important ecological role on many landscapes, but human-caused wildland fires can damage areas that might not otherwise experience fire or that might burn with less frequency or severity.<sup>1</sup> The recent Horseshoe Two and Monument fires in southern Arizona provide vivid examples of the devastation that can result from human-caused wildland fires. The Horseshoe Two Fire burned nearly 223,000 acres in May and June 2011, mostly on the Coronado National Forest, and cost millions to suppress. Similarly, according to preliminary estimates from the agencies, the Monument Fire burned more than 30,000 acres in the Huachuca Mountains in June and July 2011, destroyed more than 60 homes, and forced thousands of residents living near Sierra Vista, Arizona, to evacuate.<sup>2</sup>

Human-caused wildland fires are of particular concern in Arizona along the Mexico border because southeast Arizona is a primary entry point for illegal border crossers on the U.S. southwestern border. As we reported in December 2010, illegal border crossers have been suspected of starting wildland fires either by accident—for example, from cooking fires that escape—or on purpose—for example, to divert law enforcement resources away from a particular area.<sup>3</sup> In this context, you asked us to examine

<sup>1</sup>To achieve land management objectives federal land managers sometimes use prescribed burns—fires set deliberately by land managers under weather, fuel, and temperature conditions that enable the fire to be controlled at a relatively low intensity level. In this report, we use the term “human-caused wildland fires” to refer only to human-caused fires other than prescribed burns.

<sup>2</sup>Suppression cost obligations and damages incurred as a result of these fires are estimates reported by federal agencies. We did not independently verify the accuracy of these data.

<sup>3</sup>GAO, *Federal Lands: Adopting a Formal, Risk-Based Approach Could Help Land Management Agencies Better Manage Their Law Enforcement Resources*, [GAO-11-144](#) (Washington, D.C.: Dec. 17, 2010).



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wildland fires that occurred in Arizona within 100 miles of the U.S.-Mexico border during the previous 5 years.<sup>4</sup> For such wildland fires, this report examines (1) their number, cause, size, and location; (2) the economic and environmental effects of human-caused wildland fires that burned 10 or more acres; (3) the extent to which federal agencies determined that illegal border crossers were the ignition source of wildland fires on federal and tribal lands; and (4) ways in which the presence of illegal border crossers has affected fire suppression activities in this area.

To determine the extent of wildland fire occurrence in the Arizona border region, we collected federal and state wildland fire occurrence data from databases at the National Interagency Fire Center (NIFC)<sup>5</sup> for fires that occurred within Arizona during calendar years 2006 through 2010.<sup>6</sup> From these data, we identified those wildland fires that occurred within 100 miles of the Arizona-Mexico border. For these fires, we then analyzed the data to identify the acreage burned and general cause—human or natural—cited for ignition. We assessed the reliability of the data we used by reviewing information about the underlying database systems and discussing the data with agency officials responsible for managing these databases, and determined that the data were sufficiently reliable for the purposes of presenting acreage burned and general cause of wildland fires. We also obtained information from the Department of Defense regarding wildland fire incidents on its lands in the region—which is not included in NIFC’s data—and included these data in our overall analysis. We identified those human-caused wildland fires that burned 10 or more acres (referred to as significant fires for the purposes of this report) and

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<sup>4</sup>In this report we refer to the area in Arizona that is within 100 miles of the U.S.-Mexico border as the Arizona border region.

<sup>5</sup>NIFC, located in Boise, ID, is the nation’s logistical support center for controlling and extinguishing wildland fires and coordinates the mobilization of fire suppression supplies, equipment, and personnel at the federal, regional, and local levels. Additionally, NIFC maintains historical fire occurrence data for the Department of Agriculture’s Forest Service and the Department of the Interior’s Bureau of Indian Affairs, Bureau of Land Management, Fish and Wildlife Service, and National Park Service. NIFC also maintains historical fire occurrence data collected by state agencies, including the Arizona State Forestry Division, for fires on nonfederal lands.

<sup>6</sup>Unless otherwise noted, all references in this report are to calendar years rather than fiscal years. We did not include fires that occurred in calendar year 2011 because federal agencies do not collect fire documentation from local units or conduct quality assurance checks on data until the end of the calendar year, and therefore 2011 data were not complete and may not be reliable.



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obtained data on suppression cost obligations for those fires as well as available documentation of economic and environmental effects. In addition, we visited the region and discussed with federal and nonfederal fire suppression and law enforcement officials, as well as private industry representatives and private citizens in the ranching community, their experiences with wildland fire occurrence and suppression activities, as well as the economic and environmental damage as a result of human-caused wildland fires. To assess the extent to which federal agencies determined that illegal border crossers were the ignition source of these fires, we reviewed agency documents to identify criteria for conducting investigations into the ignition source of human-caused wildland fires. We also collected and analyzed fire investigation reports to evaluate the extent to which fire investigations were conducted for human-caused wildland fires that burned 1 or more acres and, for those fires for which investigations were conducted, the extent to which officials identified illegal border crossers as the source of ignition. Additionally, we reviewed fire incident reports created by fire response personnel to identify the extent to which they cited illegal border crossers as a potential source of ignition. To determine the ways in which the presence of illegal border crossers has affected fire suppression in the Arizona border region, we reviewed national and regional land management wildland fire guidance to identify any practices unique to regional land management units developed in response to illegal cross-border activity. During our site visits, we also discussed with federal and nonfederal officials their experiences fighting wildland fires in the region.

We conducted this performance audit from December 2010 to November 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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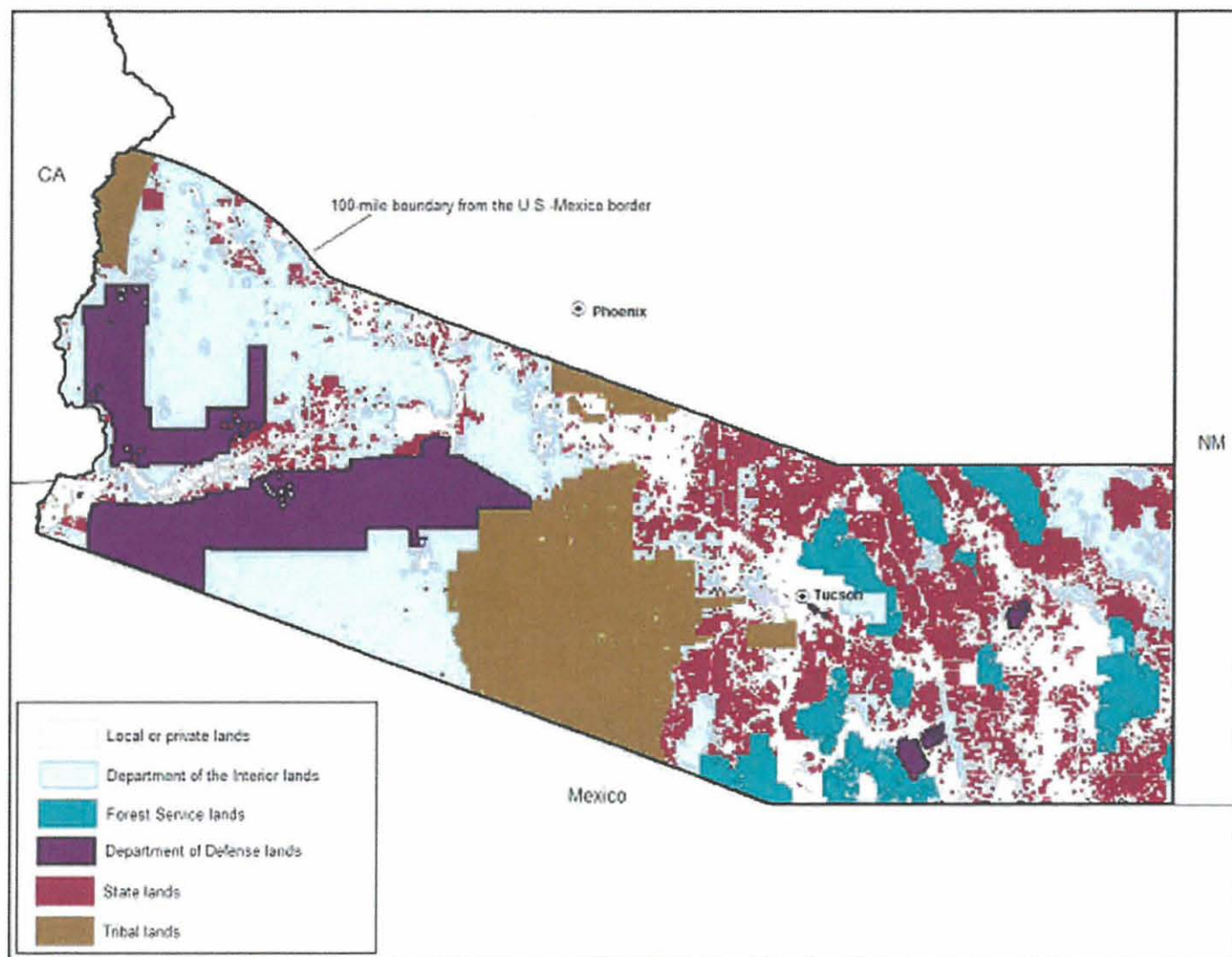
## Background

The Arizona-Mexico border extends about 370 miles, accounting for almost 20 percent of the 2,000-mile U.S.-Mexico border. About 51 percent of the land in the Arizona border region is managed by the federal government, primarily by the Forest Service within the Department of Agriculture, four agencies within the Department of the Interior—the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), and National Park Service (NPS)—and the Department of Defense (DOD).<sup>7</sup> The remainder of the land is local or private (21 percent), state-managed (16 percent), or tribal (12 percent). Figure 1 shows the areas managed by these various entities.

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<sup>7</sup>The Department of the Interior's Bureau of Reclamation manages a very small amount of federal land in the Arizona border region. We did not include this agency in our review.

**Figure 1: Land Management in the Arizona Border Region**



Source: Department of the Interior; Mapinfo (map).

Each federal agency that manages land within the border region has a distinct mission and set of responsibilities, which may include managing the land for multiple uses, such as recreation; conserving natural and historic resources; conserving and enhancing fish, wildlife, plants, and their habitats; and providing rangeland for grazing. Federal agency responsibilities for land units in the Arizona border region include the following:



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- The Forest Service manages the Coronado National Forest, which covers almost 1.8 million acres of southeastern Arizona and New Mexico and ranges in elevations from 3,000 feet to over 10,000 feet. In addition to the preservation of natural resources, the forest is used for recreational purposes and ranchers use some of the forest for grazing. In October 2010, we reported that more illegal border crossers migrate through the Coronado National Forest than any other federal land unit along the southwestern border.<sup>8</sup> The Forest Service has reported that the number of illegal border crossers traveling in the area threatens natural resources and creates a dangerous environment for the public and for Forest Service employees.<sup>9</sup>
  - BIA provides services to several Indian tribes, including the Tohono O'odham Nation, Colorado River Nation, Fort Yuma-Quechan Nation, Ak-Chin Tribal Community, and Gila River Indian Community within the Arizona border region. The Tohono O'odham Nation, the largest Indian tribe within the Arizona border region, covers about 2.9 million acres, an area approximately the size of Connecticut. Tohono O'odham officials have previously reported that illegal border crossers cause significant damage to their lands.<sup>10</sup>
  - BLM manages numerous public lands in the border region, including the nearly half-million-acre Sonoran Desert National Monument, San Pedro National Conservation Area, and Ironwood Forest National Monument. BLM lands are used for multiple purposes, including recreation, grazing, mining, and wildlife habitat. In our November 2010 report, we reported that BLM officials posted warning signs at 11 entrance locations of the Sonoran Desert National Monument to warn

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<sup>8</sup>GAO, *Southwest Border: More Timely Border Patrol Access and Training Could Improve Security Operations and Natural Resource Protection on Federal Lands*, [GAO-11-38](#) (Washington, D.C.: Oct. 19, 2010).

<sup>9</sup>*Effects of Illegal Border Activities on the Federal Land Management Agencies, Before the Subcommittee on Interior, Environment, and Related Agencies, House Committee on Appropriations*, 109th Cong. (2006) (statement of Tina J. Terrell, Forest Supervisor, Cleveland National Forest, United States Department of Agriculture).

<sup>10</sup>*Walls and Waivers: Expedited Construction of the Southern Border Wall and Collateral Impacts to Communities and the Environment, Before the Subcommittee on Fisheries, Wildlife, and Oceans and Subcommittee on National Parks, Forests, and Public Lands of the House Committee on Natural Resources*, 110th Cong. (2008) (statement of the Honorable Ned Norris, Jr., Chairman Tohono O'odham Nation).

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the public against travel on portions of the monument because of potential encounters with illegal border crossers.<sup>11</sup>

- FWS works to preserve and enhance fish, wildlife, plants, and their habitats in wildlife refuges in the region, including the Buenos Aires, Cabeza Prieta, Imperial, and Kofa National Wildlife Refuges. In December 2010, we reported that the Refuge Manager of Buenos Aires National Wildlife Refuge testified before Congress that illegal border crossers have disturbed wildlife and created more than 1,300 miles of illegal trails, causing the loss of vegetation and severe erosion.<sup>12</sup> In addition, a portion of the refuge adjacent to the border has been closed to the public due to safety concerns caused by illegal border crossers.
- NPS is responsible for conserving the scenery, natural and historical objects, and wildlife of the national park system, which includes Coronado National Memorial, Organ Pipe Cactus National Monument, and Saguaro National Park in the Arizona border region. As was the case with the Buenos Aires National Wildlife Refuge, the Organ Pipe Cactus National Monument has previously been closed to the public because of the safety concerns associated with illegal border crossers. Officials at other sites, such as the Fort Bowie National Historic Site, have reported that the cultural and historical integrity of the site has been compromised by illegal border crossers because of the waste they have left in the area—including clothing, cans, water jugs, plastic bags, and human waste.
- DOD manages a number of installations and facilities used for testing and training its forces in the region, including Fort Huachuca, the Yuma Proving Grounds, the Barry M. Goldwater Range, and Davis-Monthan Air Force Base. DOD officials told us that training missions at the Barry M. Goldwater Range have been delayed or altered due to the presence of illegal border crossers.

Additionally, agents of the U.S. Border Patrol—an office within the Department of Homeland Security (DHS)—patrol federal and nonfederal

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<sup>11</sup>GAO, *Border Security: Additional Actions Needed to Better Ensure a Coordinated Federal Response to Illegal Activity on Federal Lands*, [GAO-11-177](#) (Washington, D.C.: Nov. 18, 2010).

<sup>12</sup>[GAO-11-144](#).



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lands near the border to find and apprehend persons who have illegally crossed the U.S. border. Border Patrol is responsible for controlling and guarding the boundaries and borders of the United States against the illegal entry of people who are not citizens or nationals.<sup>13</sup> Border patrol agents have the authority to search, interrogate, and arrest undocumented aliens and others who are engaging in illegal activities, such as illegal entry and smuggling of people, drugs, or other contraband on federal lands and other areas up to 100 miles from the border.

Each of the federal land management agencies also has responsibility to respond to wildland fires on federal lands, while the Arizona State Forestry Division and other entities—including tribal and local fire departments—have primary responsibility for responding to wildland fires on state, local, and private lands. When a wildland fire starts on federal land, federal policy directs federal agencies to consider land management objectives—identified by land and fire management plans developed by each land management unit—and the structures and resources at risk when determining whether and how to suppress it. Historically, the Forest Service and the Interior agencies attempted to suppress all wildland fires quickly because of their potentially damaging effects on local economies and natural environments; in recent decades, however, the agencies fundamentally reassessed their understanding of naturally occurring wildland fire's role on the landscape, and they began to see more benefits from these wildland fires. For instance, fire can limit the spread of insects and diseases, reduce brush and weeds, and return the nutrients to the soil, where they help produce a new generation of plants. For ranchers whose cattle are dependent on the new generation of plants, fire can burn unwanted brush and allow grasses to flourish in future years. If agencies determine that a naturally ignited wildland fire can promote land management objectives, they may use less aggressive fire suppression strategies that not only can reduce fire suppression costs in some cases but can also be safer for firefighters by reducing their exposure to unnecessary risks. In contrast, interagency policy calls for these agencies to initiate suppression activities immediately for all human-caused wildland fires.

Fire suppression efforts are mobilized through an interagency incident management system, which depends on the close cooperation and

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<sup>13</sup>8 U.S.C. §§ 1101-1537.



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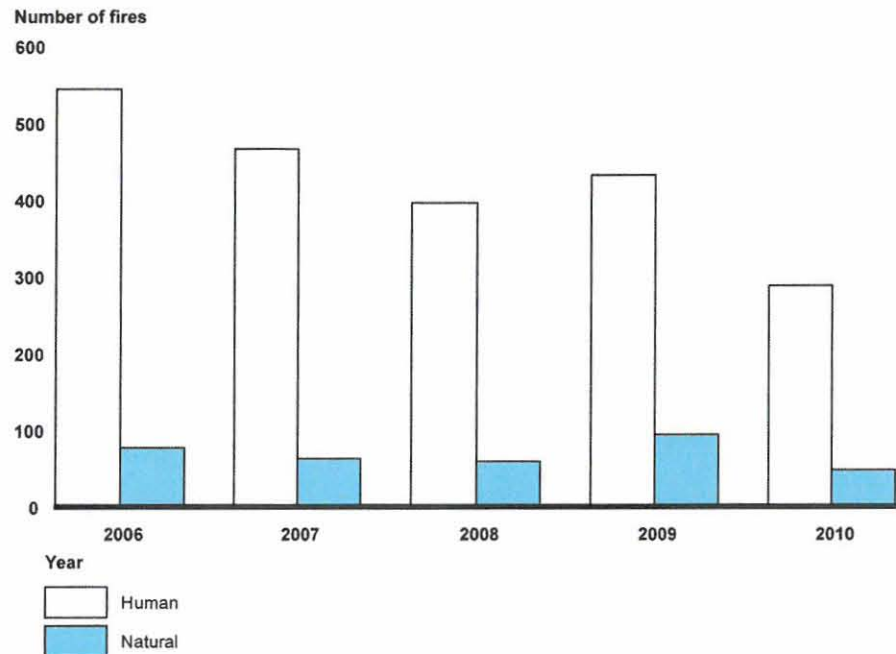
coordination of federal, state, tribal, and local fire protection entities. Fighting wildland fires—which can burn across federal, state, and local jurisdictions—can require investments of personnel, aircraft, equipment, and supplies and can result in substantial fire suppression expenditures.

To document fire occurrence, fire personnel prepare a fire incident report, and the information from these reports populates the agencies' fire data management systems. The information collected in these reports includes basic data such as date the fire started, location, general cause (natural or human), number of acres burned, and the date the fire was extinguished. Firefighters can also include narrative information in these reports, such as information about suppression activities or fire cause.

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## Number, Cause, Size, and Location of Wildland Fires in the Arizona Border Region

From 2006 through 2010, at least 2,467 wildland fires occurred in the Arizona border region. Most of these fires were caused by human activity, burned less than 1 acre each, and were ignited on federal or tribal land. Federal and state agencies determined that 2,126 of these fires, or about 86 percent, were caused by human activities (see fig. 2). This percentage is consistent with the national average for wildland fires caused by human activities; according to NIFC data, about 87 percent of all wildland fires that occurred nationally from 2006 through 2010 were caused by human activities.

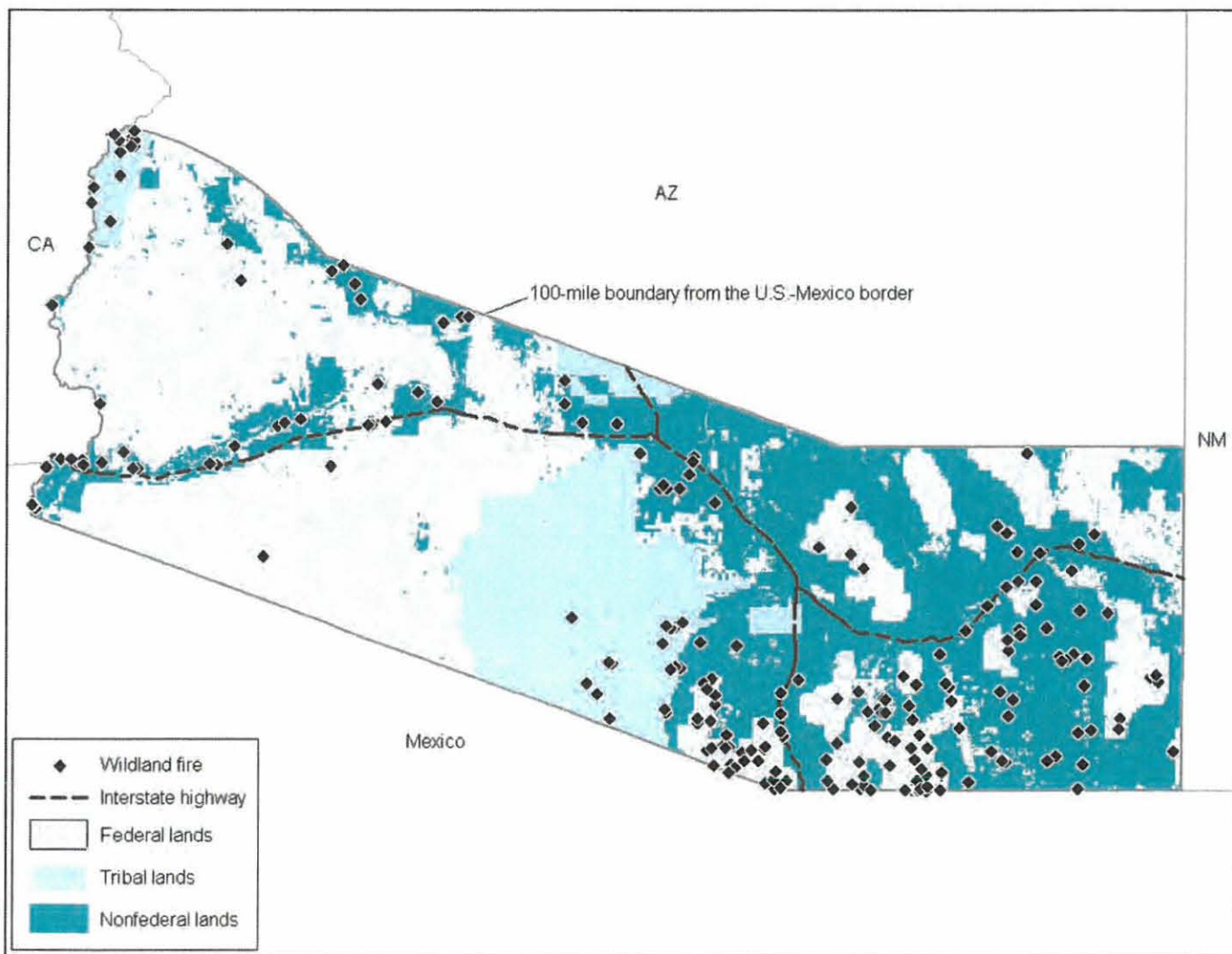
**Figure 2: Wildland Fires in the Arizona Border Region, by Cause, 2006-2010**

Source: GAO analysis of USDA, Interior, DOD, and Arizona Forestry Division data.

Most of the human-caused wildland fires—1,364, or 64 percent—burned less than 1 acre of land each; 508 fires burned from 1 to 10 acres each; and 241 fires were significant, burning 10 or more acres each.<sup>14</sup> These 241 significant human-caused wildland fires burned a total of more than 123,000 acres, which accounts for about 99 percent of all acres burned during this time by human-caused wildland fire in the region; the largest of these wildland fires—the 2009 Elkhorn Fire—burned more than 23,000 acres. See figure 3 for the location of significant human-caused wildland fires during this period. The 2011 Horseshoe Two and Monument fires, which occurred after the period for which we analyzed data, were much larger than any of the fires that occurred from 2006 through 2010. Based on preliminary information, federal agencies reported that these two fires burned more than 250,000 acres—more than twice the cumulative total of all significant human-caused wildland fires in the area during the previous 5 years.

<sup>14</sup>DOD did not provide fire size data for 13 fires occurring on its lands.

**Figure 3: Location of Significant Human-Caused Wildland Fires in the Arizona Border Region, 2006-2010**



Source: GAO analysis of federal and state agency data; MapInfo (map).

Note: Significant human-caused wildland fires are those that burned 10 or more acres.

Of the 341 fires that federal and state agencies determined to be natural ignitions—caused by lightning—156, or 46 percent, burned less than 1 acre each; 87 burned from 1 to 10 acres each; and 98 fires were significant, burning 10 acres or more. Naturally ignited wildland fires burned nearly 74,000 acres, although agency officials explained that



some of these fires were allowed to burn (i.e., they were not suppressed by firefighters) for ecological and resource management purposes.

Of the 2,467 wildland fires included in our review, the majority of the fires—1,553, or 63 percent—were ignited on federal or tribal lands. The remaining fires were ignited on state, local, or private lands (see table 1).

**Table 1: Wildland Fires in the Arizona Border Region from 2006-2010, by Land Management Entity**

Land management entity	Total number of wildland fires	Number of human-caused wildland fires that burned between 1 and 10 acres	Number of significant human-caused wildland fires that burned 10 acres or more
BIA/tribal	558	180	28
Forest Service	395	49	71
BLM	340	28	37
DOD <sup>a</sup>	176	27	9
NPS	42	1	3
FWS	42	8	17
State, local, or private	914	215	76
<b>Total</b>	<b>2,467</b>	<b>508</b>	<b>241</b>

Source: GAO analysis of federal and state agency data.

<sup>a</sup>DOD data may not present a comprehensive account of wildland fires on DOD-managed lands. For example, DOD did not provide fire size data for 13 wildland fires.

## The Economic and Environmental Effects of Significant Wildland Fires in the Arizona Border Region Are Not Fully Known

Significant human-caused wildland fires in the Arizona border region have resulted in a number of economic and environmental impacts. Economic impacts include millions of dollars in fire suppression costs, destruction of homes and ranching operations, and impacts on regional tourism. Environmental impacts include damaged habitat for endangered species and expansion of nonnative plants in the region. However, it is not possible to fully quantify the effects of these fires on the region's economy or environment because complete information needed for such analyses is not available.

**Significant Human-Caused Wildland Fires Have Resulted in Various Economic Impacts, but the Full Impact on the Region Is Unknown**

Significant human-caused wildland fires in the Arizona border region have had various economic impacts. These impacts include (1) the costs associated with suppressing wildland fires; (2) the destruction of property, including homes and ranching infrastructure; and (3) impacts on tourism. While we were able to identify specific examples of these fires' impacts on the area's economy, we could not determine the overall impact of these fires on local economies because complete information is not available that would allow such an analysis.

*Fire suppression costs.* In response to significant human-caused wildland fires that occurred from 2006 through 2010 in the Arizona border region, federal land management agencies obligated more than \$33 million for suppression activities,<sup>15</sup> and the state of Arizona obligated almost \$2 million.<sup>16</sup> Forest Service suppression obligations accounted for more than \$26 million, or about 80 percent of all federal obligations to suppress these fires. The amount of funding obligated for individual significant human-caused wildland fires varied widely. For a majority of these fires, federal and state agencies obligated less than \$25,000 per fire. Conversely, for 23 fires, or about 10 percent, agencies obligated more than \$250,000 each, with the 2010 Horseshoe Fire, which burned more than 3,400 acres on the Coronado National Forest, accounting for more than \$10 million—nearly a third of all federal obligations for significant human-caused wildland fires in the region from 2006 through 2010.<sup>17</sup> Characteristics affecting suppression costs include fire size; fuel types; fire intensity; physical terrain; proximity to the nearest community; total value of structures close to the fire; and special management

<sup>15</sup>The dollar values are as provided by the agencies and have not been adjusted for inflation. Based on preliminary information from the Forest Service and Department of the Interior, the 2011 Horseshoe Two and Monument fires together cost more than \$70 million to suppress—twice the total reported federal and state obligations for suppressing all significant human-caused wildland fires from 2006 through 2010. However, as noted earlier, these fires occurred after the period of our data analysis and we have not independently assessed the validity of this cost information.

<sup>16</sup>These amounts do not include suppression cost data from DOD or local entities with fire management responsibilities, such as individual tribes, municipalities, or local fire protection districts. In addition, for those agencies that provided us with data, suppression costs can continue to be incurred several years after a fire occurrence; thus, our analysis may not include all fire suppression costs associated with these fires.

<sup>17</sup>See appendix II for detailed information on funding obligations, duration, and burned acreage associated with each significant human-caused wildland fire that occurred in the Arizona border region from 2006 through 2010.



considerations, such as whether the fire was burning in a wilderness or other designated area. It is also important to note that suppression costs may represent only a fraction of the total true costs for these fires. For example, one study that reviewed six fires of at least 40,000 acres in the western United States found that, in these cases, other costs associated with the fires, such as damage to properties and ecosystems and loss of economic activities, were generally several times higher than suppression costs.<sup>18</sup>

*Destruction of property and injuries to homeowners.* Significant human-caused wildland fires in the region have destroyed houses and other property and injured residents. For example, according to the Forest Service, the 2009 Canelo Fire, which burned over 4,000 acres, destroyed at least three residences, several outbuildings, and numerous vehicles. In addition, one homeowner was seriously burned during that wildland fire and required hospitalization. Similarly, the 2011 Monument Fire destroyed more than 60 homes, according to preliminary agency estimates.

*Impacts on ranching operations.* Significant human-caused wildland fires have also affected ranching operations in the region. Such fires have damaged grazing allotments and related improvements<sup>19</sup>—such as fences, water tanks, and pipelines—located on federal lands and used by private ranchers.<sup>20</sup> The Forest Service reported obligating more than \$100,000 in long-term restoration and rehabilitation funds to repair fences, protect watersheds, and clean water tanks on federal grazing

<sup>18</sup>Western Forestry Leadership Coalition, *The True Cost of Wildfire in the Western U.S.* (April 2010).

<sup>19</sup>To provide access to grazing, both BLM and the Forest Service divide their rangelands into allotments, which can vary in size from a few acres to hundreds of thousands of acres of land. Because of the land ownership patterns that occurred when the lands were settled, the allotments can be adjacent to private lands, or they can be intermingled with private lands.

<sup>20</sup>For fires that occurred during 2011 (subsequent to the period of our data analysis), the Forest Service has reported preliminary estimates of at least \$3.8 million in damage to federal grazing allotments, including from the Horseshoe Two Fire—which occurred on the Coronado National Forest. According to the Forest Service, the Horseshoe Two fire damaged approximately 120 miles of fence and destroyed at least 50 improvements, such as corrals, pipelines, water tanks, and wells.



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allotments damaged by four significant human-caused wildland fires.<sup>21</sup> Additionally, from 2006 through 2010, Forest Service officials told us they provided about \$56,000 in fencing and pipeline materials to repair damage on 15 allotments burned by significant human-caused wildland fires.<sup>22</sup> Forest Service officials told us the agency does not always have supplies to provide, however, and generally does not provide labor to repair damage to allotments. As a result, local ranchers can incur costs for labor and materials to repair damage to allotments. One rancher whose federal grazing allotment was burned during the 2009 Hog Fire told us that, although the Forest Service has offered to provide the materials to replace fencing that was burned during the fire, in order to use the allotment again, he would have to spend about \$250,000 for labor costs to build the new fence to Forest Service specifications.

Additionally, federal agency officials and private ranchers told us that, in some circumstances, ranchers must move their cattle from federal grazing allotments because agencies have determined that the damage to the vegetation on which the cattle feed requires time to recover—typically 1 to 3 years, according to federal officials. As a result of significant human-caused wildland fires from 2006 through 2010, Forest Service officials reported that some cattle were removed from 20 allotments, and grazing schedules were altered for at least an additional 5, to allow vegetation to recover. A Forest Service official told us that the grazing capacity for 17 of these allotments has been reduced by 25 percent because of wildland fires. Additionally, one allotment that covers more than 50,000 acres was affected by 13 significant human-caused wildland fires from 2006 through 2010, according to federal agency officials, resulting in the repeated removal of cattle from the allotment and an altering of grazing schedules. According to industry representatives and private ranchers, moving cattle from an allotment negatively affects ranchers because they must either find alternative locations to graze their

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<sup>21</sup>The Forest Service was the only agency that reported to us that it provided funds or materials to restore damaged rangeland improvements in response to significant human-caused wildland fires that occurred from 2006 through 2010. The Forest Service manages about 320 active federal grazing allotments in the Arizona border region.

<sup>22</sup>Another Forest Service official reported providing an additional \$65,000 for fencing material for 2 additional allotments damaged by fire, and added that an additional 15 had been affected by wildland fires from 2006 through 2010—although this official could not determine how much of this damage resulted from significant human-caused wildland fires and how much resulted from fires that were smaller or naturally ignited.

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cattle or purchase additional feed. Further, private ranchers stated that the value of their cattle can potentially decrease as a result of the stresses to the animals associated with the fires and transfers between allotments.

*Impacts on tourism.* Significant human-caused wildland fires can also affect tourism. According to a representative from the Cochise College Center for Economic Research,<sup>23</sup> as well as local residents that we spoke with, fires can affect tourism because access to trails, campgrounds, and roads can be temporarily restricted and, more broadly, fires can diminish the appeal of the region for tourists. For example, local residents told us that hospitality businesses in Portal, Arizona, have been particularly vulnerable to the economic impacts of wildland fires because these businesses are dependent on visitors to the Coronado National Forest. If access to the forest is restricted, as it was in 2010 as a result of the Horseshoe Fire, these residents told us it can have a direct impact on local businesses.

While the preceding examples provide some understanding of the nature of the economic impacts of significant human-caused wildland fires in the Arizona border region, we could not quantify the overall effect of these fires on the region because comprehensive and consistent data are not available. For example, we found no data that would allow us to determine the extent to which the closures of national forests and other public lands have affected tourism in the region, and we likewise did not find data that would allow us to identify the cumulative impact of significant human-caused wildland fires on tourist-related businesses.<sup>24</sup> Moreover, the economic researcher from the Cochise College Center for Economic Research noted that it is difficult to assess the overall economic impact of such incidents because the Arizona border region is rich in ecotourism resources. As a result, it is possible that visitors who could not visit a specific location may have still visited the region, simply choosing to visit other local areas. Additionally, as noted in one study we reviewed, identifying the real cost of wildland fires on the economy is

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<sup>23</sup>Cochise County is one of four counties entirely within the Arizona border region. Five additional counties are partially within the region.

<sup>24</sup>The 2011 Horseshoe Two Fire did require the evacuation of Portal for several days, causing businesses in the community to close, but the precise economic effect of the evacuation on the region is likewise unknown.



difficult because few data sources are consistent from fire to fire, and many lack any data at all.<sup>25</sup> According to this study, the effects resulting from individual fires are unique to each fire and cannot be generally extrapolated to other fires. The representative we spoke to from the Cochise College Center for Economic Research also noted that the economic effects of wildland fire can be mixed and, therefore, difficult to delineate. For example, while wildland fires can provide a temporary boost to several industries in the region—such as construction and retail and restaurant sales—that boost could be offset by increases in home insurance premiums in the area and lost revenue and wages from other displaced businesses or workers.

### Significant Human-Caused Wildland Fires Have Damaged the Environment, but the Full Extent Is Unknown

Significant human-caused wildland fires have damaged the natural environment in the Arizona border region, but the comprehensive effects are unknown, in part because—as with the economic effects of wildland fires—complete information is not available on the environmental effects of wildland fire. According to our analysis of federal emergency treatment plans and discussions with federal agency and tribal officials, the most common environmental effects of wildland fire in the region are expansion of nonnative plant species, degraded endangered species habitat, and soil erosion. These effects may result from both significant human-caused wildland fires and other fires. The following are descriptions of these environmental effects and examples of the effects that have been noted from individual instances of significant human-caused wildland fires in the region.<sup>26</sup>

*Expansion of nonnative plant species.* Plant species that are not native to southern Arizona, such as buffelgrass and tamarisk—commonly known as salt cedar—can regenerate more quickly following wildland fires than native species and may displace such species from their traditional ranges. The expansion of these species can also alter natural fire patterns by making areas susceptible to burning with more severity or frequency than they traditionally would. For example, the 2009 Powers

<sup>25</sup>Dennis L. Lynch, "What Do Forest Fires Really Cost?," *Journal of Forestry* (September 2004).

<sup>26</sup>As we have reported, wildland fire can have dramatic positive and negative environmental effects. See GAO, *Wildland Fires: Forest Service and BLM Need Better Information and a Systematic Approach for Assessing the Risks of Environmental Effects*, GAO-04-705 (Washington, D.C.: June 24, 2004).



Fire, a human-caused wildland fire that burned 260 acres, destroyed native vegetation such as cottonwood and willows along the Gila River. As a result, BLM predicts that nonnative salt cedar will increase in density along the river. BLM noted in its postwildfire environmental damage assessment that the increased density of salt cedar will degrade the habitat because salt cedar actively resprouts after wildland fires and can create enough fuel to burn again within 5 years.

*Damage to endangered species habitat.* Southern Arizona is home to a number of federally listed threatened and endangered plant and animal species.<sup>27</sup> Some wildland fires can damage the habitats of these species and, in turn, threaten their continued existence. For example, the 2007 San Luis Fire—a human-caused wildland fire that burned 68 acres of mostly BLM land—damaged riparian areas that are habitat for two bird species federally listed as endangered, the Southwestern Willow Flycatcher and the Yuma Clapper Rail, as well as another that is a candidate for listing, the Yellow-Billed Cuckoo.<sup>28</sup>

*Increased soil erosion.* Soil erosion can also result from wildland fires in the region. During the seasonal “monsoon rains” that Arizona typically experiences in the summer, areas where wildland fires have burned away the vegetation holding soil together may experience increased runoff and mudslides that can damage natural habitats, watersheds, roads, and trails. For example, an official with the Tohono O’odham Nation told us that the nation is concerned about the impact the human-caused 2009 Elkhorn Fire will have on the Kearney’s Blue Star, which is an endangered plant species. The fire itself did not damage the plant’s population, but as a result of the fire, water runoff and soil erosion are expected to increase, which would threaten the plant’s population at lower elevations.

To mitigate such impacts on federal lands in the region, from 2006 through 2010, federal agencies obligated nearly \$1.9 million through the Burned Area Emergency Response program—a federal program that

<sup>27</sup>The Endangered Species Act of 1973 protects plant and animal species that are either facing extinction (endangered species) or are likely to face extinction in the foreseeable future (threatened species) and protects the ecosystems upon which they depend.

<sup>28</sup>Riparian areas—the narrow bands of green vegetation along the banks of rivers and streams—are widely recognized as crucial to the overall ecological health of rangelands.

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provides funds to stabilize and prevent degradation to natural and cultural resources resulting from the effects of wildland fires. Agencies prioritize and fund emergency treatments based on risks identified in damage assessments. According to Forest Service guidance, Burned Area Emergency Response program assessments should be conducted for fires that burn more than 300 acres, though damage from smaller fires can be assessed if federal land management agency officials believe that life, property, or damage to natural or cultural resources are at risk. From 2006 through 2010, federal agencies assessed damage from 20 significant human-caused wildland fires in the Arizona border region for emergency treatment funding under this program. Based on these assessments, federal officials recommended that funds be used to provide emergency treatment in response to damage from 9 of these fires and approved at least partial funding for 7 of these fires. For 10 of the 11 assessed fires for which they did not recommend emergency treatment funding, officials believed that the damaged areas would recover naturally in 5 years or less without any treatment program.

The above examples provide some understanding of the types of environmental effects of significant human caused wildland fires in the Arizona border region, but we were unable to quantify the full environmental impacts for the region because comprehensive information is not available. For example, according to federal agency officials, the amount of funding provided through the Burned Area Emergency Response program reflects only a portion of the total monetary value of the environmental damages resulting from significant human-caused wildland fires, in part because not all such fires receive funding under the program. In addition, federal officials told us that many of the significant human-caused wildland fires that have occurred in the Arizona border region have likely resulted in at least some environmental damage, but these effects are generally not formally documented or recorded by federal agencies, and often it is many years before the extent of the damage is fully evident. Similarly, state agencies such as the Arizona State Forestry Division and the Arizona State Land Department could not provide us with data regarding the environmental consequences of significant human-caused wildland fires that occurred on state lands because, according to state officials, they do not maintain such data.



## Federal Agencies Did Not Conduct Investigations of All Human-Caused Wildland Fires and Thus Cannot Determine the Number Ignited by Illegal Border Crossers

The frequency with which illegal border crossers have caused wildland fires on federal lands in the Arizona border region is not fully known, in part because federal land management agencies did not conduct investigations of all human-caused wildland fires that occurred on their lands as called for by interagency policy. Further, the fires that were investigated—about 18 percent of the fires we examined (77 of 422 fires)—were selected for investigation based primarily on the availability of fire investigators, according to agency officials, rather than on the specific characteristics of the fires, such as their size or location. Without more information on the specific causes of these fires, the agencies lack key data that could help them target their fire prevention efforts.

## Federal Agencies Did Not Conduct Investigations of All Human-Caused Wildland Fires As Called for by Interagency Policy

Federal agencies cannot identify all of the human-caused wildland fires that were ignited by illegal border crossers on federal lands, in part because they did not conduct the investigations called for by interagency policy. This policy—*Interagency Standards for Fire and Fire Aviation Operations*, which applies to the Forest Service, BLM, FWS, and NPS—calls for these agencies to determine the general cause—human or natural—for all wildland fires on federal lands they manage.<sup>29</sup> If a wildland fire is determined to be human-caused, the interagency policy calls for a more in-depth investigation to be conducted, typically by personnel trained to conduct fire cause investigations. Similarly, the *Wildland Fire and Aviation Program Management Operations Guide*, which applies to BIA, also calls for thorough cause investigations for all wildland fires suspected to be human caused.

<sup>29</sup>DOD is not a signatory to this policy and does not generally conduct investigations into the causes of wildland fires on its properties. As a result, we did not include the agency in our analysis.



There were 422 human-caused wildland fires that burned 1 or more acres on federal or tribal lands between 2006 and 2010.<sup>30</sup> Of these, federal fire investigators conducted investigations for 77—or about 18 percent. Table 2 and figure 4 provide additional information on the fires investigated.

**Table 2: Number of Wildland Fires Investigated, by Agency, 2006-2010**

Land management agency	Human-caused wildland fires that burned 1 or more acres		
	Number of fires	Number investigated	Percentage investigated
BIA/tribal <sup>a</sup>	208	1	<1
Forest Service	120	57	48
BLM	65	7	11
NPS	4	2	50
FWS	25	10	40
<b>Total</b>	<b>422</b>	<b>77</b>	<b>18</b>

Source: GAO analysis of Forest Service and Interior data.

<sup>a</sup>Wildland fires occurring on Tohono O'odham tribal land are included in the BIA total. The Tohono O'odham Nation has assumed responsibility for wildland fire suppression and investigation responsibilities, under the Indian Self-Determination and Education Assistance Act, as amended.

Officials from the Forest Service, BIA, BLM, and FWS told us that the primary reason that many human-caused wildland fires were not investigated was because the agencies lacked available trained fire investigators. For example, both BLM and Forest Service officials told us the agency's law enforcement officers, who are trained to conduct such investigations, do not have the time to investigate all human-caused wildland fires because of other responsibilities, such as providing security for firefighters and their equipment. Similarly, an official from the Tohono O'odham Nation stated that, although he believes it is important to determine the cause of these fires, the nation's fire management program does not have adequate funding to support a wildland fire investigator.

<sup>30</sup>These 422 fires include those that occurred on Forest Service, BIA, BLM, NPS, FWS, or tribal land. Given the elevated level of wildland fire activity that occurred during the 2011 fire season in the Arizona border region, we limited our analysis to human-caused wildland fires burning 1 acre or more, rather than all human-caused fires, in order to obtain data needed for this review without creating an unreasonable burden for fire and law enforcement officials providing us with the data. We also did not include the 36 human-caused wildland fires that burned 1 or more acres on DOD land in the Arizona border region. See appendix I for more information on our methodology.

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This official also stated that he has requested assistance from federal agencies to investigate some fires, but the agencies have been unable to provide such assistance because of other priorities.

The lack of fire investigations is not a recent issue. A 1998 Department of the Interior Inspector General report found weaknesses with the agency's ability to investigate fires, stating that seven of the eight BLM district offices reviewed by the Inspector General did not give sufficient priority to fire investigations and did not adequately document the fire investigations that were completed.<sup>31</sup> Even for those fires that are investigated, federal officials told us a decision on whether to investigate a fire is generally not based on the specific characteristics of the fire, such as its size or location. Rather, they said the decision generally depends on the availability of a trained wildland fire investigator at the time of the fire. Although it appears the agencies have concluded they cannot investigate all fires because they do not have sufficient resources, they have not developed a strategy for determining which fires to investigate. Such a strategy could include specific criteria for identifying which fires to investigate, such as fires that are larger than average, that stand to burn sensitive areas, or that otherwise may have effects that make their origins important to understand. Without such a strategy, the agencies are unable to ensure that those human-caused wildland fires with the greatest effects are consistently investigated.

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<sup>31</sup>BLM, *Reimbursement of Firefighting Costs*, Bureau of Land Management, 98-I-551 (Washington, D.C.: July 1998).

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**Federal Fire Investigators  
Identified Illegal Border  
Crossers as a Suspected  
Cause of Ignition in 30 of  
the 77 Fires They  
Investigated**

Based on our review of agency investigation reports, illegal border crossers were a suspected cause of ignition for 30 of the 77 investigated wildland fires, or about 39 percent.<sup>32</sup> Five of the 30 wildland fires in which illegal border crossers were a suspected cause burned less than 10 acres each, 16 burned from 10 to 100 acres each, and 9 burned more than 100 acres each. These 30 wildland fires were all located within 40 miles of the U.S.-Mexico border and occurred on the Coronado National Forest, Buenos Aires National Wildlife Refuge, or Organ Pipe Cactus National Monument (see fig. 4 for the location of wildland fires that occurred on federal lands and which illegal border crossers were identified as a suspected cause).

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<sup>32</sup>Some investigations resulted in the identification of more than one potential ignition source, meaning that the total number of suspected ignition sources is greater than the total number of fires investigated.